APPLICATION OF DISCRETE MATERIAL FORCES INDUCED BY THE FINITE ELEMENT METHOD

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The presentation concentrates on the use of material forces in discretization schemes using Finite Elements. The theory of material forces together with the underlying balance laws is briefly recast. The balance laws are discretized in a form consistent with the Finite Element approximation.

Examples show the occurrence of material forces for a variety of situations, such as cracks, inhomogeneities or defects. Further consideration is given to material forces which originate not from physical causes but from the numerical method itself. These "artifical" material forces are used to improve the numerical resolution: They can either be employed to modify node positions keeping the connectivity of the mesh or to indicate regions for a possible mesh refinement. Examples will demonstrate both strategies.

References

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[2] R. Mueller, G.A. Maugin, "On Material Forces and Finite Element Discretizations,",*Computational Mechanics*, v. 29(1), p. 52–60, 2002.